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TECHNICAL GUIDANCE

FOR

STRUCTURAL DESIGN

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SECTION 1

INTRODUCTION

1. INTENT: The purpose of this document is to provide guidance to Architect/Engineers (A/E's) performing services for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), in the policies and practices for structural design. This document shall be used as a guide only and is not intended to cover every situation or restrict innovative design alternatives. Where good design practices indicate superior methods, variances from this document should be brought to the attention of SOUTHNAVFACENGCOM, Code 0754 at 843-820-7351.

2. OTHER GUIDANCE AND CRITERIA AVAILABLE: For further guidance and sources of criteria refer to the latest revision of:

(a) SOUTHNAVFACENGCOM P-141, "GUIDE FOR ARCHITECT-ENGINEER FIRMS PERFORMING SERVICES FOR SOUTHERN DIVISION, NAVAL FACILITIES ENGINEERING COMMAND".

(b) "SOUTHNAVFACENGCOM INDEX OF CRITERIA" - Includes guide specifications, Design Manuals, Military Handbooks and other various military publications.

(c) MIL-HDBK-1002/1 - "STRUCTURAL ENGINEERING GENERAL REQUIREMENTS". INACTIVE for New Design, superseded by ASCE 7-98

(d) MIL-HDBK-1002/2 - "LOADS". INACTIVE for NEW Design, superseded by ASCE 7-98.

(e) MIL-HDBK-1002/3 - "STRUCTURAL ENGINEERING, STEEL STRUCTURES"

(f) DM-2.04 - "STRUCTURAL ENGINEERING, CONCRETE STRUCTURES"

(g) MIL-HDBK-1002/5 - "TIMBER STRUCTURES"

(h) MIL-HDBK-1002/6 - "ALUMINUM STRUCTURES, COMPOSITE STRUCTURES, OTHER STRUCTURAL MATERIALS"

(i) MIL-HDBK-1002/7 - "SEISMIC RESPONSE SPECTRA (PROPOSED)"

(j) DM-2.08 - "BLAST RESISTANT STRUCTURES"

(k) DM-2.9 - "MASONRY STRUCTURAL DESIGN FOR BUILDINGS"

(1) TI-809-04 - "SEISMIC DESIGN FOR BUILDINGS" for seismic loads, TI-809-04 can be found at the

following web site, http://
http://www.hnd.usace.army.mil/techinfo/ti/809-04/ti80904.htm.

3. ADDITIONAL GUIDANCE:

(a) All Designers should read the "Statement of Work" portion of the A/E contract.

(b) All designers should read the guide specifications.

(c) Follow the most updated version of Navy Design Criteria. Where there is a conflict between Naval criteria and National codes, Naval criteria shall govern. Where no Naval criteria exists, use generally accepted industry practice.

NAVFAC criteria is moving toward adoption of a single set of national building codes (IBC 2000) which adopts established commercial/industry criteria.

4. PLANS, SPECIFICATIONS AND CALCULATIONS:

4.1 Plans:

(a) Provide foundation and framing plans at the same scale and orientation as the architectural plans. Coordinate with requirements of the A/E Guide, SOUTHNAVFACENGCOM P-141.

(b) Plans should be the largest scale practical, generally 1/811 scale should be the minimum.

(c) Place legend, design and material criteria on the first structural sheet.

(d) Detail all special connections completely such that no further design is necessary.

(e) Coordinate design with all disciplines.

4.2 Specifications:

(a) Provide non-proprietary specifications for all work in the project. Proprietary items may be used, but only with prior approval.

(b) The completed design should be free of conflicts between the contract drawings and specifications. If conflicts do exist, the specification will govern over the contract drawings when interpreting the documents.

(c) Guide specifications are for a designer's use in preparing a project specification.

(d) Include in the project specifications only what is required for the specific project.

4.3 Required Calculations:

(a) Provide all calculations to support the design of all elements and loading conditions.

(b) Calculations shall include the analysis and design of all (major cost contributing elements) beams, columns, walls, foundations, slabs, bracing, diaphragms, equipment supports, etc., and the connections to each other to provide a safe, stable, efficient and cost effective structural system. An adequate number of sketches, with sufficient detail to make the designers intention clear, concise and easily understandable shall be provided. All assumptions and references to codes, standards, criteria, drawings and computer outputs shall be noted as necessary.

(c) Computer Outputs shall be identified similar to the calculations and may be referenced as an appendix or attachment. Document the program name, source and version. All schematic models used for computer input shall be provided. The models shall show, as a minimum, nodes/joint, element/member, materials/properties, and all loadings, temperature changes, induced settlements and/or deflections, etc., and a list of their combinations considered in the analysis. Computer results shall include an output summary listing the maximum/minimum stresses/forces and deflections for each element and the structure reactions for each loading combination.

5. MASONRY:

5.1 Composite Masonry Walls: Do not use composite masonry walls, i.e., two wythes of masonry units in which the collar joint between is filled solidly with grout, unless written approval is obtained from SOUTHNAVFACENGCOM Codes 0712 and 0754. If a composite wall is approved, the vertical reinforcing should be placed in the cells of the interior wythe and not within the collar joint. Also make sure the specifications do not allow the high lift grouting method.

5.2 Cavity/Veneer Walls: All cavity/veneer walls shall have a 2 inch air space, not including insulation space. Distances between wythes shall not exceed 4 inches unless a detailed wall tie analysis is performed. The exception to this requirement is that in areas of high seismic activity the maximum space between wythes for veneer walls is 2 inches (per TI-809-04) including insulation space. Provide a note on the drawings requiring the contractor to keep the mortar cleaned out of the cavity as

construction progresses. Multi-wythe walls shall be designed in accordance with Section 5.8 of ACI 530-99/ASCE 5-92, “Building Code Requirements for Masonry Structures” and TI-809-04, “Seismic Design For Buildings”.

5.3 Masonry: The practice of designers providing complete design of members and connections will continue with assumption of total design responsibility. It is SOUTHNAVFACENGCOM’S policy that the designer maintain complete design responsibility for all reinforced masonry designs and transfer of this responsibility will not be permitted.

6. STRUCTURAL STEEL

6.1 Design Policy: It is SOUTHNAVFACENGCOM’S policy that the A/E of record will be responsible for all structural steel connections resulting from his or her design. The transfer of this responsibility to the construction contractor will not be permitted.

6.2 Acceptable Methods of Analysis: The ASD and LFRD method of steel design are acceptable methods of design. As stated by the American Institute of Steel Construction (AISC), the LRFD Specification for Structural Steel Buildings is intended as an alternate to the current ASD structural steel design. SOUTHNAVFACENGCOM encourages the use of the method that promotes a cost benefit to the project.

7. REINFORCED CONCRETE:

7.1 Reinforced Concrete: The practice of designers providing complete design of members and connections will continue with assumption of total design responsibility. It is SOUTHNAVFACENGCOM’S policy that the designer maintain complete design responsibility for all reinforced concrete designs and transfer of this responsibility will not be permitted.

8. TIMBER:

8.1 Timber: The practice of designers providing complete design of members and connections will continue with assumption of total design responsibility. It is SOUTHNAVFACENGCOM’S policy that the designer maintain complete design responsibility for all timber designs and transfer of this responsibility will not be permitted.

9. SEISMIC:

9.1 Quality Control: TI-809-04 requires peer review for the seismic design of buildings in Seismic Use Group III, Seismic Design Category D, E, or F; all buildings being designed with

seismic isolation or energy dissipation; and other buildings that may be designated by the cognizant design authority. The peer review is described in paragraph 1-10 in TI-809-04.

9.2 DESIGN POLICY: Seismic design shall be in accordance with TI-809-04, “SEISMIC DESIGN FOR BUILDINGS” and the National Earthquake Hazard Reduction Program (NEHRP). Additionally, the designer is encouraged to incorporate the latest technology resulting from on going research and seismic event investigations.

Executive Order 12941 requires the upgrade and full compliance with current seismic criteria of any Federally owned or leased facility that undergoes a rehabilitation/repair/ modernization project that exceeds 50% of the facility replacement cost.

10. ANTI-TERRORISM/ FORCE PROTECTION

10.1 Frame Support System

For inhabited structures of three stories or more, use a moment resisting frame support system and design in structural redundancy that allows the loss of one primary vertical or one primary lateral load-carrying element without progressive collapse.

10.2 Vertical Load Carrying Elements

For all multistory inhabited structures, design all multistory vertical load carrying elements assuming loss of lateral support at any one floor level (i.e., a laterally unsupported length equal to two stories).

10.3 Exterior Masonry Walls

Exterior masonry walls will be reinforced in all inhabited structures.

10.4 Floor Slab Reinforcement

On multistory inhabited structures, run concrete floor slab reinforcement continuously through both faces of the slab and into the beams and columns to improve capability to withstand load reversals.

10.5 Exterior Wall Elements

Exterior walls in inhabited structures will employ one-way wall elements spanning vertically to minimize blast loads on columns.

10.6 Structural Separation

Structurally separate portions of inhabited structures with lesser occupancies from the inhabited portions of the structure when portions with lesser occupancies are located within prescribed standoff distances.